

thin-needle biopsy, but in smaller lesions that have the best opportunity for resection the tumor may be missed. Therefore a percutaneous needle biopsy of the pancreas in which the findings are negative for tumor does not rule out carcinoma of the pancreas.

Five-year cures of pancreatic carcinoma are still rare and are usually associated with lesions in the head of the pancreas where common bile duct obstruction occurs early. Lesions of the body and tail seldom come to attention until they have spread beyond the confines of the pancreas. Pancreatoduodenectomy remains the best palliation for the 15 percent to 20 percent of patients found to have resectable lesions in the absence of metastases. The hope that more extensive resections such as total pancreatectomy would provide improved cure rates has proved to be unfounded. The addition of vagotomy at the time of pancreatoduodenectomy does not seem to reduce the incidence of peptic ulceration and gastrointestinal hemorrhage in patients undergoing pancreatoduodenectomy for cancer.

The 40 percent to 50 percent of patients with metastasis or locally unresectable cancer of the pancreas, most of whom are jaundiced but well enough to undergo celiotomy, are best managed by the simplest biliary bypass possible, that is, cholecystojejunostomy and chemical splanchnicectomy with administration of a solution of 15 ml of 6 percent phenol or 100 percent alcohol to provide pain relief. There is no evidence that the incidence of cholangitis is less with either Roux-en-Y cholecystojejunostomy or choledochojejunostomy. Most authors advocate gastrojejunostomy at the time of biliary bypass, otherwise 20 percent of patients will require a second operation for gastric outlet obstruction. There is a high incidence, about 20 percent, of gastrointestinal bleeding after biliary bypass in patients with pancreatic cancer. In many of these patients, the gastrointestinal bleeding is a major contributor to the death of the patient. The cause of peptic ulceration and bleeding in these patients is believed to result from the diversion of bile from the duodenum in patients whose gastrointestinal tract has already been deprived of pancreatic secretion as a result of tumor obstructing the proximal pancreatic duct.

The use of percutaneous transhepatic tube decompression of the obstructed common duct can be helpful in improving liver function in patients being prepared for resection who have been jaundiced for more than a month.

Percutaneous transhepatic decompression is not a substitute for operative biliary and gastric bypass and chemical splanchnicectomy except in a patient too ill to undergo celiotomy. A further disadvantage of percutaneous transhepatic decompression is that some patients with curable ampullary or distal common bile duct lesions who have a much more favorable prognosis than patients with pancreatic cancer may not be identified and resected. An additional disadvantage of percutaneous transhepatic decompression in patients with carcinoma of the pancreas is that the incidence of

cholangitis is higher than after operative cholecystojejunostomy.

Chemotherapy with present regimens has not provided appreciable prolongation of life in patients with pancreatic cancer, though with some of the more recent combination chemotherapy the incidence of response has reached the 40 percent level.

Irradiation with heavy ions that can be better focused and have greater penetration has shown some promise with or without adjunctive chemotherapy in patients with locally unresectable lesions. However, the number of patients treated with these modalities has been small and a somewhat selected group. Radiation therapy with interstitial implants into the primary tumor is also being used but is a very cumbersome and logistically difficult technique to carry out in the operating room. The combination of irradiation and chemotherapy seems to have shown the greatest number of patients surviving as long as 40 months.

Local heating of tumors by ultrasonic or diathermic means has not yet proved applicable to the pancreas.

In summary, there is a need for a tumor marker to assist in screening the at-risk population. All attempts at cure of pancreatic cancer to date have to be considered, at best, palliative measures. Pancreatoduodenectomy offers the best palliation in patients who have small localized lesions without metastases. The procedure can only be justified if the mortality is low and should therefore not be done by an occasional operator.

CHARLES F. FREY, MD

#### REFERENCES

- Feinstein AR, Horwitz RI, Spitzer WO, et al: Coffee and pancreatic cancer—The problems of etiologic science and epidemiologic case-control research. *JAMA* 1981 Aug 28; 246(9):957-961
- Frey C, Twomey P, Keehn R, et al: Randomized study of 5-FU and CCNU in pancreatic cancer: Report of the Veterans Administration Surgical Adjuvant Cancer Chemotherapy Study Group. *Cancer* 1981 Jan 1; 47:27-31
- Sarr MG, Cameron JL: Surgical management of unresectable carcinoma of the pancreas. *Surgery* 1982 Feb; 91:123-133
- van Heerden JA, ReMine WH, Weiland LH, et al: Total pancreatectomy for ductal adenocarcinoma of the pancreas. Mayo Clinic experience. *Am J Surg* 1981 Sep; 142:308-311

## Trauma Care—Recent Advances

TRAUMA, defined as accidental or intentional injury, is the most common cause of death in persons aged 1 to 38 years. The death rate for trauma in the age group 15 to 24 has risen from 106 per 1,000 in 1968 to 120 per 1,000 in 1978. During that same period, the overall mortality for persons aged 25 to 64 declined 16 percent. Trauma mortality in the United States is 50 percent higher among American teenagers than for teenagers in Sweden, England and Japan combined. The estimated cost of death and disability due to trauma is in excess of \$228 million annually. Only recently has information become available that allows rational evaluation of the potential efficacy of different aspects of the emergency health care system.

Concerning prehospital care, improvement in transportation and training of ambulance personnel has resulted in identifiable benefits in some areas of emergency

illness, particularly cardiac arrest from coronary artery disease. Of the 650,000 people who die of arteriosclerotic heart disease annually (primarily from coronaries), upgrading the training of ambulance personnel from emergency medical technician to paramedic service has resulted in a 10 percent increase in survival (that is, of 100 cardiac arrests, an additional 10 lives have been saved, an improvement from 7 percent to 17 percent). In cardiac arrest from coronary artery disease, an ambulance response time of less than two minutes will allow 55 percent of patients to be admitted to hospital, whereas if the response time is eight minutes, only 19 percent will survive long enough to be admitted to hospital. The comparable discharge survival data are 33 percent and 12 percent, respectively. The improvement in survival of a cardiac arrest victim from coronary artery disease has been in the range of 10 percent. Because about 25 percent of these patients sustain cardiac arrest acutely, the net potential benefit of prehospital care is an improvement in survival of 2.5 percent ( $25 \times 10$ ) of all cardiac arrest victims.

Extrapolation of data on cases of cardiac arrest from coronary artery disease to trauma cases is inappropriate. Although it is attractive to assume that more training and utilization of on-site equipment such as pneumatic antishock garments (military antishock trouser, or MAST suits) should produce improvement in the care of patients with severe injury, no data exist to prove this thesis. Information is beginning to emerge that establishes that transport delays for purposes of on-site resuscitation are associated with excessive mortality if the injury is life threatening. For example, in one study evaluating traumatic injury to the heart, there were no survivors among patients in whom field resuscitation with concomitant prolonged prehospital delay occurred. If prompt transport of victims with heart wounds occurs, a 20 percent to 30 percent survival is possible. Similar findings for other types of severe injuries associated with hemorrhagic shock are applicable when the availability of prompt and appropriate care is within a 15- to 20-minute transport time. In patients with less acute but equally life-threatening injuries, a "golden interval"—usually less than an hour—is best spent in transportation to a trauma center after stabilization of fractures and initiation of intravenously given fluid therapy.

Maximal use of the first hour after injury depends on geographic considerations. In areas of dense population with short distances to a trauma care center, such as in San Francisco, ground transportation is the optimal transport means. In rural areas, such as the Imperial Valley (south central California), rotary or fixed-wing transport to a trauma care center has resulted in a substantial improvement in mortality for injuries of comparable magnitude, when victims are rapidly moved to definitive care, rather than receiving initial extensive prehospital and "nearest hospital" care.

Studies done in California and elsewhere speak to the need for continued definition of a regional system

of trauma care, as defined by the report "Categorization of Emergency Facilities and Trauma Centers" by the Committee on Trauma of the American College of Surgeons. Several studies have shown that 30 percent to 35 percent of trauma deaths are potentially salvageable, if treated in a trauma center. The absence of a system for transportation and care of trauma victims and the persistence of the "nearest hospital" concept continue to result in unnecessary death after injury. The increasing tendency for transport delay for purposes of extensive field resuscitation is contributing to this problem.

Because about 5 percent of motor vehicle injuries are critical, a system to minimize the death rate from such injuries is necessary. Because as high as 50 percent of deaths from injury occur *after* the patients reach the hospital, continual evolution of trauma care centers, appropriate prehospital care, proper transportation systems and development of new trauma care centers are mandatory.

It is now apparent that trauma care centers can improve mortality from injury. Because transportation systems are available to bring patients to a trauma care center, emphasis should be placed on rapid transport and not on field resuscitation.

GEORGE F. SHELDON, MD

#### REFERENCES

- Bergner L, Eisenberg M, Haustrom A, et al: Evaluation of Paramedic Services for Cardiac Arrest, US Dept of Health and Human Services publication No. (PHS) 82-3310. Government Printing Office, 1981 Dec
- Hospital resources for optimal care of the injured patient. *Bull Am Coll Surg* 1979 Aug; 64:43-48
- Neuman TE, Bockman MA, Moody P, et al: An autopsy study of traumatic deaths—San Diego County, 1979. *Am J Surg* 1982 Dec; 144(4): 722-727
- West JG, Trunkey DD, Lim RC: Systems of trauma care—A study of two counties. *Arch Surg* 1979 Apr; 114:455-460

## Parathyroid Autotransplantation

THE SUCCESS AND SIMPLICITY of parathyroid autotransplantation favors the use of this technique in standard surgical practice for those patients who stand to lose all parathyroid function as a consequence of a neck exploration or in whom residual or in situ parathyroid tissue has a good likelihood of becoming hyperactive. The principles of parathyroid transfer are the same as those for other grafts without a vascular pedicle such as a split-thickness skin graft in that the graft will be profoundly ischemic until capillary perfusion begins in three to five days. During this time the tissue is nourished by diffusion only. The graft will succumb to ischemia if vascular ingrowth is delayed by such factors as low perfusion pressure, regional scar, hematoma or infection. However, a split-thickness skin graft is prepared to function as an epithelium within 10 to 14 days of grafting while the endocrine epithelium of parathyroid tissue temporarily loses function during the three to five days when only diffusion is providing metabolic exchange. This diffusion support is only adequate for subsequent survival if the parathyroid graft is reduced to fragments no larger than 1 to 2 mm in diameter. The subsequent function of the graft will not be evident